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ON THE PROBABLE AGE OF FLINT IMPLEMENTS FOUND IN GRAVEL-BEDS.

To the Editor of the Ulster Journal of Archæology.

SIR,—A most interesting question, regarding a certain class of antiquities, is now occupying the attention of some of the ablest men of the present day, both in Great Britain and on the Continent; and I am induced to bring it forward in your *Journal* by the hope that some light may be thrown upon it in the North of Ireland, where antiquities of a very similar kind have been found in vast numbers. I cannot better place the subject before your readers, as it stands at present, than by the two following extracts from recent publications:—

At the late Meeting of the British Association, at Aberdeen, Sir Charles Lyell said—"No subject has lately excited more curiosity and general interest among geologists and the public than the question of the antiquity of the human race; and whether or no we have sufficient evidence to prove the former co-existence of Man with certain extinct mammalia." After reviewing the recent discoveries of human remains in the volcanic breccia of Le Puy en Velay, in France, a district occupied by extinct volcanoes, he proceeds—"But I am fully prepared to corroborate the conclusions which have been recently laid before the Royal Society by Mr. Prestwich, in regard to the age of the flint implements associated, in undisturbed gravel in the north of France, with the bones of elephants at Abbeville and Amiens. For a clear statement of the facts, I refer to the abstract of Mr. Prestwich's memoir in the Proceedings of the Royal Society for 1859, and have only to add that I have myself obtained abundance of flint implements during a short visit to Amiens and Abbeville. Two of the worked flints of Amiens were discovered in the gravel pits of St. Acheul, one at the depth of 10, and the other of 17 feet, below the surface, at the time of my visit. The stratified gravel resting immediately on the chalk in which these rudely-fashioned instruments are buried, belongs to the 'post-pliocene' period, all the fresh-water and land shells which accompany them being of existing species. The great number of the fossil instruments, which have been likened to hatchets, spear-heads, and wedges, is truly wonderful. More than a thousand of them have already been met with in the last ten years, in the valley of the Somme, in an area 15 miles in length. I infer that a tribe of savages, to whom the use of iron was unknown, made a long sojourn in this region. Although the accompanying shells are of living species, I believe the antiquity of the Abbeville and Amiens flint instruments to be great indeed, if compared to the times of history or tradition. I consider the gravel to be of fluviatile origin; but I could discover nothing in the structure of its several parts indicating cataclysmal action—nothing that might not be due to such river-floods as we have witnessed in Scotland during the last half century. It must have required a long period for the wearing down of the chalk which supplied the broken flints for the formation of so much gravel at various heights, sometimes 100 feet above the present level of the river Somme; for the deposition of fine sediment, including entire shells, both terrestrial and aquatic; and also for the denudation which the entire mass of stratified drift has undergone, portions having been swept away, so that what remains of it often terminates abruptly in old river-cliffs, besides being covered by a newer unstratified drift. To explain these changes, I should infer considerable oscillations in the level of the land in that part of France—slow movements of upheaval and subsidence, deranging, but not wholly displacing, the course of the ancient rivers. Lastly, the disappearance of the Elephant, Rhinoceros, and other genera of quadrupeds now foreign to Europe, implies, in like manner, a vast lapse of ages, separating the era in which the fossil implements were framed and that of the invasion of Gaul by the Romans."—[Report in *Athenæum.*]

"In 1849, M. Boucher de Perthes, President of the 'Société d'Emulation' of Abbeville, published the first volume of a work entitled 'Antiquités Celtiques et Antédiluviennes,' in which he announced the important discovery of worked flints in beds of undisturbed sand and gravel containing the remains of extinct mammalia. Although treated from an antiquarian point of view, still the statement of the geological facts by this gentleman, with good sections by M. Ravin, is perfectly clear and consistent. Nevertheless, both in France and in England, his conclusions were generally considered erroneous; nor has he since obtained such verification of the phenomena as to cause so unexpected a fact to be accepted by men of science. There have, however, been some few exceptions to the general incredulity. The late Dr. Rigollot, of Amiens, urged by M. Boucher de Perthes, not only satisfied himself of the truth of the fact, but corroborated it, in 1855, by his 'Mémoire sur des Instruments en Silex trouvés à St. Acheul.' Some few geologists suggested further inquiry, whilst Dr. Falconer, himself convinced by M. de Perthes' explanations and specimens, warmly engaged Mr. Prestwich to examine the sections.

"Mr. Prestwich, who confesses that he undertook the inquiry full of doubt, went last Easter, first to Amiens, where he found, as described by Dr. Rigollot, the gravel-beds of St. Acheul capping a low chalk-hill a mile S.E. of the city, about 100 feet above the level of the Somme, and not commanded by any higher ground. The following is the succession of the beds in descending order:—

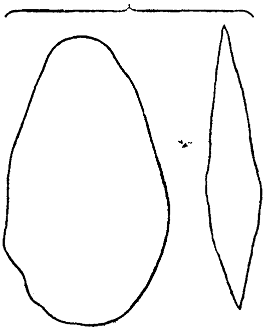
	Average thickness.
1. Brown brick-earth (*many old tombs and some coins*), with an irregular bed of flint gravel. No organic remains. *Divisional plane between* 1 *and* 2*a very uneven and indented*................	10 to 15 ft.
2*a*. Whitish marl and sand, with small chalk debris. Land and fresh-water shells (*Lymnea*, *Succinea*, *Helix*, *Bithynia*, *Planorbis*, *Pupa*, *Pisidium*, and *Ancylus*, all of recent species) are common, and mammalian bones and teeth are occasionally found..........................	2 to 8 ft.
2*b*. Coarse subangular flint-gravel,—white with irregular ochreous and ferruginous seams—with tertiary flint pebbles and small sandstone blocks. Remains of shells as above, in patches of sand. Teeth and bones of the elephant, and of a species of horse, ox, and deer,—generally near base. This bed is further remarkable for containing worked flints ("Haches" of M. de Perthes, and "Langues de Chat" of the workmen). Uneven surface of chalk............................	6 to 12 ft.

"The flint implements are found in considerable numbers in 2*b*. On his first visit, the author obtained several specimens from the workmen, but he was not successful in finding any himself. On his arrival, however, at Abbeville, he received a message from M. Pinsard of Amiens, to inform him that one had been discovered the following day, and was left *in situ* for his inspection. On returning to the spot this time with his friend Mr. Evans, he satisfied himself that it was truly *in situ*, 17 feet from the surface, in undisturbed ground, and he had a photographic sketch of the section taken in June, 1859.

"On revisiting the pit, since the reading of his paper, in company with several geological friends, Mr. Prestwich was fortunate to witness the discovery and extraction by one of them, Mr. J. W. Flower, of a very perfect and fine specimen of flint-implement, in a seam of ochreous gravel, 20 feet beneath the surface. They besides obtained thirty-six specimens from the workmen.

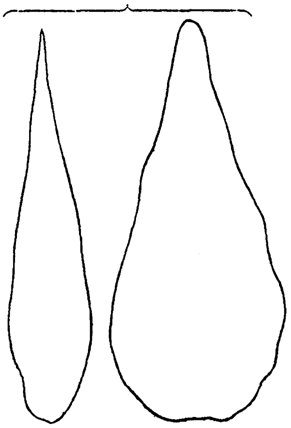
"The only mammalian remains the author here obtained, were some specimens of the teeth of a horse, but whether recent or extinct the specimens were too imperfect to determine; and part of the tooth of an elephant (*Elephas primigenius?*). In the gravel-pit of St. Roch, 1½ mile distant, and on a lower level, mammalian remains are far more abundant, and include *Elephas primigenius*, *Rhinoceros tichorhinus*, *Cervus somonensis*, *Bos priscus*, and *Equus*;* but the workmen said that no worked flints were found there, although they are mentioned by Dr. Rigollot.

Fig. 1.



Front Section. Side Section.

Fig. 2.



Side Section. Front Section.

One-third the natural size.

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* To this list Mr. Prestwich adds the *Hippopotamus*, of which creature four fine tusks were obtained on this last visit.

"At Abbeville, Mr. Prestwich was much struck with the extent and beauty of M. Boucher de Perthes' collection. There were many forms of flints, in which he, however, failed to see traces of design or work, and which he should only consider as accidental; but with regard to those flint-instruments termed "axes" ("haches") by M. de Perthes, he entertains not the slightest doubt of their artificial make. They are of two forms, generally from 4 to 10 inches long: the outlines of two specimens are represented in the preceding diagram. They are very rudely made, without any ground surface, and were the work of a people probably unacquainted with the use of metals. These implements are much rarer at Abbeville than at Amiens, fig. 1 being the common form at the former, and fig. 2 at the latter place. Mr. Prestwich was not fortunate enough to find any specimens himself; but from the experience of M. de Perthes, and the evidence of the workmen, as well as from the condition of the specimens themselves, he is fully satisfied of the correctness of that gentleman's opinion, that they there also occur in beds of undisturbed sand and gravel.

"One very remarkable instance has already been brought under the author's notice by Mr. Evans since their return from France. In the 13th volume of the 'Archæologia,' published in 1800, is a paper by Mr. John Frere, F.R.S. and F.S.A., entitled 'An Account of Flint-Weapons discovered at Hoxne in Suffolk,' wherein that gentleman gives a section of a brick-pit in which numerous flint-implements had been found, at a depth of 11 feet, in a bed of gravel containing bones of some unknown animal; and concludes, from the ground being undisturbed and above the valley, that the specimens must be of very great antiquity, and anterior to the last changes of the surface of the country,—a very remarkable announcement, hitherto overlooked.

"Mr. Prestwich purposely abstains, for the present, from all theoretical considerations, confining himself to the corroboration of the facts:—

"1. That the flint-implements are the work of man.

"2. That they were found in undisturbed ground.

"3. That they are associated with the remains of extinct Mammalia.

"4. That the period was a late geological one, and anterior to the surface assuming its present outline, so far as some of its minor features are concerned.

"He does not, however, consider that the facts, as they at present stand, of necessity carry back Man in past time more than they bring forward the great extinct Mammals towards our own time, the evidence having reference only to relative and not to absolute time; and he is of opinion that many of the later geological changes may have been sudden or of shorter duration than generally considered.

"The paper concludes with a letter from Mr. John Evans, F.S.A. and F.G.S., regarding these implements from an antiquarian rather than a geological point of view, and dividing them into three classes:

"1. Flint flakes,—arrow-heads or knives.

"2. Pointed weapons truncated at one end, and probably lance or spear heads (fig. 2.)

"3. Oval or almond-shaped implements with a cutting edge all round, possibly used as sling-stones or as axes (fig. 1.)

"Mr. Evans points out, that in form and workmanship those of the two last classes differed essentially from the implements of the so-called Celtic period, which are usually more or less ground and polished, and cut at the wide and not at the narrow end; and that, had they been found under any circumstances, they must have been regarded as the work of some other race than the Celts, or known aboriginal tribes. He fully concurs with Mr. Prestwich, that the beds of drift in which they were found were entirely undisturbed."—[Proceedings of the Royal Society, May, 1859.]

Having now, in some measure, explained the nature of the controversy, we may proceed to inquire—What are the exact conditions or circumstances under which the different varieties of flints are found in the North of Ireland, which are supposed by Irish antiquaries to have been arrow heads, &c.? and next—What are the differences in form and character, if any, between the flints supposed to have been artificially shaped, found in France, England, and Ireland?

It strikes me, that the collections of flint implements belonging to Mr. Bell, of Dungannon, and other collectors in Ulster, should supply material evidence as regards the form, and that many of your northern collectors should be able to supply evidence as to the exact particulars of the discovery *in situ* of flint flakes of every shape and kind, so that a theorist might be enabled to form an opinion as to the age of specimens, and of the special circumstances under which the flint articles found were originally placed, whether on the surface of a soil already formed and placed permanently, and through which the flints may have descended, or whether they, having been dropped originally on the surface of hard land or rock, were swept onwards by water along with other drift, and deposited with other materials, thus constituting evidence, if they are manufactured articles, that human beings existed antecedently to those times, the records of which are now only found in certain gravel-beds in England, France, Ireland, &c.

Now, looking at the question simply as a mechanical one, and bringing to bear upon it my own observations made on sand-banks on the sea shore, and on the motion of sand-bars in rivers, it really appears to me that the flint flakes found in the sands and gravels of France, England, and Ireland, whether they have much or little appearance of art in their forms, are not likely to have been transported and placed where they are now discovered by the same agencies which had transported and placed the pieces of stone, more or less spherical, which constitute the beds in which the flint flakes are found.

If one observes the motion of the materials composing the sand-bar in a river, the stones appear to roll and hop along more or less, according to the velocity of the current; and the speed with which they move is evidently due to the direct impact of the water on their surfaces. The more lumpy a stone is, and the lighter it is, the better chance it has of being drifted along. Its attrition against other stones helps to knock off its own angles and the angles of other stones it comes in contact with, so that the action which we see going on between the water of a river and the materials constituting a sand-bar in it, is analogous to that which takes place on a small scale in a barrel filled with small stones, when being formed into playing marbles by the rolling action of the barrel after it is charged with water.

As a mechanical question, I can understand how lumps of stone can be drifted, and how they can be ground down into pebbles of all sizes. I can understand, also, how gravel and sand of different degrees of fineness and gravity can be carried different distances, and be deposited in different beds, and in the most fantastic forms; for I have seen such things done on the great scale, on the shore, and also on the small scale, by boys who have been washing the pure ore from pounded quartz, &c., in Devonshire and Cornwall. But I confess I cannot understand how a flake of flint could be drifted along with gravel or sand composed of fragments more or less globular, and exposing direct opposition to a flowing current; for this would have the effect, not of carrying the flint forward at all, but of turning it so that its sharper end or side would meet the current, which would press it down on the bottom, while the more or less globular particles of stone would roll and jump over it. Thus the flake of flint, instead of being carried forward with the drift, would be left behind; and the drift would be deposited without any admixture of flint flakes, unless indeed the flint flakes had wooden shafts or handles attached to them, as in such a case they would, no doubt, be transported, and might be deposited when and where they separated from their shafts. This, it strikes me, is the only chance left open for the placing of these flakes of flint *in situ* with drift, but it would apply to the discovery of flint flakes in old mud or clay deposits also.

And here I may remark, that no amount of rudeness or apparent imperfection in the shape of a flake of flint, is an argument against its having been used and intentionally made by a savage or a civilized man, as a tool or weapon. The flakes or flints said to have been found at Marathon, and believed to have been used by the Persian army, are so rude and inartificial in appearance, that one can hardly believe such things were manufactured, or could have been used by a semi-civilized people; but when one considers that a flake of flint, no matter what its form or size, if carried by an arrow into the vitals of a Greek, would be likely to kill him, we see sufficient reason why such things may have been made and used by the Persians or their allies against the Greeks.

Again, looking at this matter in its mechanical relations, we know that the sharpness of the edge or point of a flake of flint, when used as a tool, lasts only for a few seconds; and, as the savage seldom attempts to sharpen the edge of a flint flake,* he casts it away and takes up a new one, and so goes on making flint flakes, using them and casting them away as they become blunt, we might say by the hundred, daily, if he is anxious about his work in wood or leather. Indeed the fancy of making flakes, and fanciful articles from flint flakes, formerly, in flinty districts, may have been a sort of agreeable mode of passing the time with the ancients, as it is said to have been with some of the western Indians in North America about forty years ago, whose fastidiousness would not allow them to scrape a bone or use the same flint knife at different meals, casting away the flint knife, as if it were due to the local genii of the place where it had been used, and probably made a few minutes before it was used.

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* Out of many thousands I have examined in Ireland, and which, I am sure, were made by human hand, I never observed more than *two* which had been sharpened by friction.

In the good old times, in places where human beings had little or no metal, and plenty of flint which readily split into flakes, they were no doubt very extravagant in the manufacture of flint flakes. Each answered for a moment while quite recent, for a knife, and then became useless and was cast away, so that the number of flint flakes manufactured and used up must have been incredible in certain localities, and the number now found diffused affords little more than a trace of a manufacture which, in places where the metals were scarce and good flints plenty, occupied a considerable portion of the attention of the people. I have been told that in some places in the North of Ireland, the quantity of flint flakes is so great, that one would suppose a manufactory of flint articles for sale must have existed on the spot, for that no ordinary usage of flint flakes could explain the nature of those accumulations.

A friend of mine has stated to me that, in the potteries in England, where they frequently mix together the materials, clay and calcined flint, for making china, in the course of a few years they occasionally find the flint deposited in masses or lumps of different sizes at the bottom of the heaps; that, somehow, the flint has separated from the clay, with which it had been thoroughly mixed, and is now found detached and conglomerated into masses, not very unlike the nodules of flints so common in the chalk formation of England and Ireland.

This operation is indeed a very curious one, and looks as if both chemical and mechanical forces were in operation, leading to such results, not altogether unlike the formation of *calculi* in the animal structure, under very different circumstances. I do not see that chemical science can throw any light on the proper question before us, the deposit of the flint flakes in the drift; but the laws of mechanics may do so, which lead us to question or deny the inference that the flint flakes found are an original part of the drift in which they are found. These laws lead to the conclusion that these flint flakes have been dropped* upon its upper surface at some time after it was formed, and that they have afterwards sunk into it; their motion downwards being due to their weight, their shape, their greater expansion and contraction from heat and cold compared with that of the materials surrounding them, their incapacity for turning or giving way to their neighbouring particles, on occasions when water coming from above or below, by the laws of capillary attraction, must expand and therefore move the mass in one direction, and when drained off, must move it in the opposite direction.

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* They may have been dropped either before or after the water left the drift. Thus, at Toome bar, the flints found in the water, had been always there since they were lost; but those found inland, may have been dropped before or after the level and consequent limits of Lough Neagh had been reduced to the present standard. The law given in this paper, appears to explain why antique weapons, and other things of considerable gravity, sink in bog, sand, and clay, which has not been moved sensibly after their loss. Thus, top dressing, such as gravel, clay, marl, in a few years sinks through moorish land. Sea-sand sinks and passes through strong loam, and will, under certain conditions, form a stratum beneath it. Modern things lost on spongy clay sink rapidly, and may be found beneath lighter things lost ages before. Mr. Shirley's explorations in Farney proved that when water is present, the relative ages o

All these movements of the mass, owing to heat and cold at different times, causing unequal expansion and contraction in the various materials constituting the soil, and hindering the motions due to infiltration of water, will, I think, cause flint flakes or other things shaped like them to go downwards in porous or mossy soils, so that the antiquary and the geologist may be equally puzzled to determine the relative antiquity of objects found at certain levels; the depth at which they may be found in the earth, being due, not so much to the time which may have elapsed since their loss or deposit as to the number of opportunities given to each of sinking in a mass hardly ever in a state of perfect repose, from heat and moisture.

I do not mean to say that sand and drift, except in water-ways, is moving horizontally in any appreciable degree, but I do hold that every summer's sun, and every winter's frost, and every passing shower, and every flood which passes over heaps of mixed materials on the surface of the earth, and wets them, helps to move the masses, large and small, of which these masses are composed in different degrees, momentarily; and that this motion leads to stratification, a moving up of some things and a moving down of others; and that it is to a modification of this law we are to look for the placing of the flint flakes in their anomalous position in the drift.

I have not seen any specimens of the flint flakes found recently in France, &c., nor does my theory require that I should; for it is absolute, founded on the supposition that nearly all flint arrowheads and knives are the produce of art, and indicate that man who used such things had passed over the surface of the places in which these things are found.[1] Exceptionally, it be said that in cases where flint flakes are found in caves with the bones of *carnivora* or other animals, it would not be necessary that men should have been in or have frequented such places with the beasts; but here, in such places, the presence of the flint flakes with the bones of the beasts would indicate that the beasts had been wounded by men, that the flint flakes had stuck in their flesh or viscera, and that the animals had retired to these dens, and died from the effects of the flint flakes in their systems. This is the only rational view to take of the deposit of flint flakes in such extraordinary places.

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antiquities found imbedded in the soil under it, cannot be ascertained by the depth at which they are found. The objects found in the Shannon were at different depths, and all I believe beneath the drift, on the hard bottom. Are the French flint flakes found on the bottom under the drift or in it?

[1] He may have travelled on foot if they were not covered with water, or in a canoe or on a raft if they were. Exceedingly rude flint flakes were found in and beside a canoe at the place where the river Bann leaves Lough Neagh.

It leads us back to our previous inference, that man must have, at one time, been moving about on the surface of the earth in these localities, contesting their mastery with the *carnivora,* and using, as a missile, flint flakes impelled, probably, by bows and arrows. These flint flakes are, however, no criterion of the actual amount of progress in other arts to which people using flint flakes have advanced at any time, or in any place; as the cheapest and commonest material will be used when things are to be lost or are likely to be lost, which is the case with missiles used in hunting wild beasts.

Every one admits that the hunter's manner of life must have preceded that of the pastor, who again precedes the agriculturist, who again precedes the formal manufacturer. These are all more or less combined in matured society. In North America we can see the whole progress, including flint arrow-head making, going on under different phases of society, and within very limited periods, probably, compared with those which preceded the invention of musketry. Now the time or duration of the hunter phase of society is rendered very brief, by the enormous advantage the gun or rifle gives the hunter.

In many parts of Africa, where the savage has hitherto been hardly able to hold his place in opposition to the *carnivora,* with the cheap rifle he now kills all before him; in America, the half-witted Indian revels in the destructive waste of the buffalo, his native food or game, and this undermines the chance of his children having any food. He thus puts an end to his species, as he won't work: his mission was to hunt, and in a few years he won't have any large game to hunt. He was the last to use the flint flake and the chip of obsidian as an adjunct to an arrow, or as the blade or point of a tool.

Might not American travellers help out the proper consideration of the case we have been investigating? Under what *questionable* conditions, in respect to gravel, sand, and drift, are flint flakes, similar to those recently used by the Indians, discovered in the valleys of the Rocky mountains? and in beds of lakes and rivers in Canada, &c.?

I suspect the time may be not so very remote when flint arrow-heads of all kinds were used in Europe. We want facts to confirm, amend, or reject the theory we have ventured to sketch in this paper.

They who would argue the case on the shapes of the flint flakes are, I should say, deceiving themselves and others, as all shapes of flint flakes may be used by savages for different purposes. We must take other facts to lead us in this inquiry, and should try some experiments too.

From a careful inspection of the flint arrow-heads in the Museum of the Royal Irish Academy, one is almost led to infer that they belong to many periods; for they present both primitive forms and others which strongly resemble those of metallic arrow-heads, appearing to be copies in flint of metal articles of the same kind. I find, however, several specimens which present one or other of the two forms given above from the Proceedings of the Royal Society;

and it so happens that these all exhibit evidence of weathering, and several have yellow or iron stains, so that these few specimens are probably identical with the flint articles found in England and France. I do not venture to say that all are exactly alike, as I have not had an opportunity of comparing the English and French flakes with the Irish; and unfortunately I am not informed as to the localities in Ireland where the particular specimens were found.

The whole subject is interesting to scientific persons, and should be carefully examined by antiquaries. If fully worked out, it will be found that objects of antiquity, like other materials, are subject to certain laws of distribution and arrangement in the earth, which are as yet imperfectly understood, and which, when fully developed, will enable us to comprehend how it is that many articles, comparatively modern, are found deposited at a greater depth in the ground than others which are unquestionably of higher antiquity.

Mr. E. P. Shirley was the first explorer in Ireland who drew my attention to the curious fact that the objects found by him in the Crannog or artificial island described in his *Account of Farney* (page 94), were not arranged in the ground in what an antiquary would call chronological order. Similar facts have been observed elsewhere in Ireland. In an excavation which I made, some years ago, in ground occasionally influenced by leakage from a neighbouring mill-stream, I found that some metallic things which had been dropped on the surface, had, in a few years, passed downwards several feet into the earth, from the effect of water rising upwards: and that, in another part of the same garden, common sea-sand and scraps of various kinds had gone down through clay, the sand preserving its integrity as a stratum, under the influence of repeated waterings (natural and artificial) from above.

In attempts to reclaim boggy land in this country, I have often seen the stones and gravel used for top-dressing pass down through the soil in a few years when great care was not taken to prevent the ground from becoming wet; and again, in soils badly laid down, when the drainage was not attended to, I have seen the stones coming to the surface for years, indicating that an insensible motion in soils really exists, chiefly due to the action of capillary attraction and that by means of this, coupled with the action of gravity, certain objects sink into the earth gradually until they meet with some resistance that hinders their further progress. It is thus that antiquities of stone and metal are found at varying depths in different soils, although originally they had been deposited *on the upper surface*, and had not been buried at first, as we might be disposed to infer nor covered by a layer of drift, brought by the action of water or wind, at any time.

I regret that circumstances will not permit my pursuing the investigation of this matter; but I thought it right to call attention to it.

E. CLIBBORN,
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